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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/561,883

05/08/2007

Adrian Boyle

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09/14/2010

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EXAMINER

SCARLETT, SHAKA S

ART UNIT

PAPER NUMBER

2823

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/561,883	Applicant(s) BOYLE ET AL.	
	Examiner SHAKA SCARLETT	Art Unit 2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 July 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 25,26,28-42 and 49-52 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 25,26,28-42 and 49-52 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 July 2010 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☒ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>7/30/2010</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on July 20, 2010 has been entered.

Priority

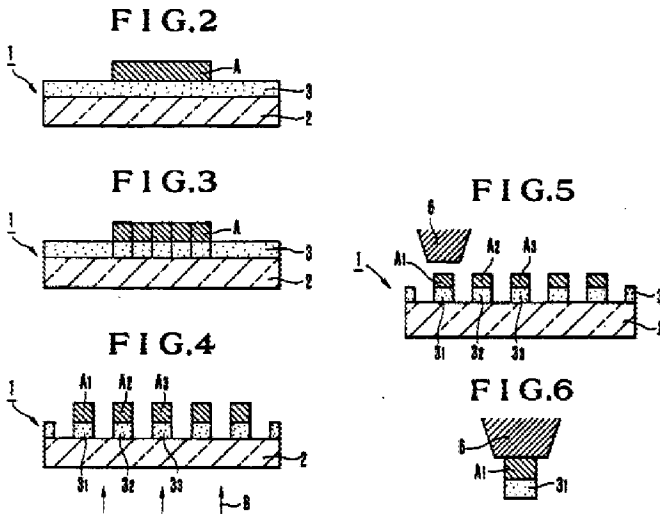
2. Acknowledgment is made of applicant's claim for foreign priority based on an application filed in the UK on 7/3/2003. It is noted, however, that applicant has not filed a certified copy of the current application as required by 35 U.S.C. 119(b).

Claim Rejections - 35 USC § 103

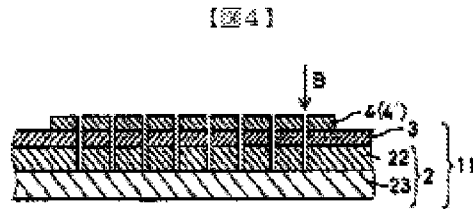
3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 25, 26, 28 – 30, 33, 37, 39, 49, 50, and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Komiyama et al. (US 5,110,388) in view of Izumi et al. (JP 2002343747 A) (as applied in the previous actions 9/2/2009 and 3/30/2010).



Regarding Claim 25, Komiyama et al. discloses a method of die bonding comprising the steps of: providing a structure comprising a wafer substrate (A) separated from a carrier base (2) by an adhesive layer carrier base (2) and the wafer (A) (Column 5, line 55 – 59; Column 6, line 4 – 5); machining through the wafer substrate (2) and the adhesive (3) layer to form a singulated die with an attached singulated adhesive layer (Column 6, line 6 - 9); curing the attached singulated adhesive layer (3) to release the singulated die and the attached singulated adhesive layer from the carrier base (2) and thereby enable the singulated die and the attached singulated adhesive layer to be removed from the carrier base and placed on a die pad (Column 6, line 24 – 27, 44 – 45, line 49 – 57; Column 7, line 6 – 7); adhering the singulated die to the die pad by curing the attached singulated adhesive layer (Column 7, line 6 – 21), but fails to disclose laser machining and a first laser machining profile used to cut through the wafer substrate and a second laser machining profile used to cut through the adhesive layer.



However, Izumi et al. discloses a method comprising a wafer (4) separated by a carrier base (2) by means of an adhesive layer (3) wherein a laser machining is performed on the wafer (4) and an adhesive layer (3) in order to form a singulated die (Paragraph 0027, line 2 – 4; Paragraph 0028, line 1 – 3).

Therefore it would have been obvious to one of ordinary skill in the art at the time of applicant's invention to modify the invention of Komiyama et al. with using a laser beam and scribing the carrier base as taught by Izumi et al. as it would provide the motivation to separate a wafer into a plurality of dies without chipping the wafer which occurs during dicing with a saw blade, and it would provide the motivation to cut through the wafer and adhesive. The claim would have been obvious because the technique for improving a particular class of devices was part of the ordinary capabilities of a person of ordinary skill in the art, in view of the teaching of the technique for improvement in other situations (KSR International Co. v. Teleflex Inc., 82 USPQ2d 1385 (U.S. 2007)). The claim would have been obvious because a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense (KSR International Co. v. Teleflex Inc., 82 USPQ2d 1385 (U.S. 2007)).

Regarding Claim 26, Komiyama et al. and Izumi et al. in combination disclose a method as claimed in claim 25, wherein the machining parameters of the laser beam include laser pulse power, laser pulse repetition rate, laser pulse width, laser beam scanning speed and laser wavelength, and wherein the first laser profile corresponds to a first set of values of the machining parameters and the second laser machining profile corresponds to a second set of values of the machining parameters, the values of the first and second sets being selected such that a speed of machining is maximized while providing a predetermined quality of singulated dies without substantial delamination of the adhesive layer and the carrier base or substantial production of burrs (Izumi et al., Paragraph 0027, line 2 – 4; Paragraph 0028, line 1 – 3; Paragraph 0036, line 1 – 8; Paragraph 0002, line 1 – 5).

Regarding Claim 28, Komiyama et al. and Izumi et al. in combination disclose the method as claimed in claim 25, wherein the step of curing the attached singulated adhesive layer comprise exposing the attached singulated adhesive to ultraviolet light (Komiyama et al., Column 6, line 24 - 30).

Regarding Claim 29, Komiyama et al. and Izumi et al. in combination disclose the method as claimed in claim 25, wherein the step of adhering the singulated die to the dice pad comprises heat curing the adhesive layer (Komiyama et al., Column 7, line 6 – 15).

Regarding Claim 30, Komiyama et al. and Izumi et al. in combination disclose the method as claimed in claim 25, wherein the step of laser machining through the wafer substrate comprises machining a blind via in the wafer substrate or a via through

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the wafer substrate and the adhesive layer (Izumi et al, Fig. 4, Paragraph 0027, line 2 – 4).

Regarding Claim 33, Komiyama et al. and Izumi et al. in combination disclose a method as claimed in claim 25, wherein the step of providing a structure comprises providing a structure having a wafer substrate less than 800 microns thick (Izumi et al., Paragraph 0036, line 1 – 2).

Regarding Claim 37, Komiyama et al. and Izumi et al. in combination disclose a method as claimed in claim 25, wherein the carrier base is one of a dicing tape, an inflexible tape suitable for thin wafer dicing or backgrinding, and a glass or other transparent solid (Komiyama et al., Paragraph 0032, line 21 – 24).

Regarding Claim 39, Komiyama et al. and Izumi et al. in combination disclose the method as claimed in claim 25, wherein singulated die and the attached singulated adhesive layer are removed from the carrier base and placed on another die to form a multi-stack die package (Komiyama et al., Column 6, line 49 – 53; Column 7, line 6 – 7, 18 – 21).

Regarding Claim 49, Komiyama et al. and Izumi et al. in combination fail to explicitly disclose the method as claimed in claim 26, wherein each of the wafer substrate and the adhesive layer is characterized by a thickness and a machinability, the first set of values for the machining parameters being selected based on the thickness and the machinability of the wafer substrate, and the second set of values for the machining parameters being selected based on the thickness and the machinability of the adhesive layer.

However, one of ordinary skill in the art is capable of choosing a set of values for laser machining depending on the thickness and material being cut. One of ordinary skill in the art would recognize that in order to achieve the result of laser machining through layers, sets of values can be selected through routine experimentation based on the thickness and material chosen.

Regarding Claim 50, Komiyama et al. and Izumi et al. in combination disclose the method as claimed in claim 26, wherein the laser machining includes using a third laser machining profile to cut into a portion of the carrier base (2), the third laser machining profile corresponding to a third set of values for the machining parameters (Paragraph 0027, line 2 – 4; Paragraph 0028, line 1 – 3).

Regarding Claim 51, Komiyama et al. and Izumi et al. in combination disclose the method as claimed in claim 50, wherein at least two of the first, second, and third laser machining profiles include the same value for at least one of the machining parameters (Izumi et al., Paragraph 0027, line 2 – 4; Paragraph 0028, line 1 – 3; Paragraph 0036, line 1 – 8).

5. Claims 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Komiyama et al. (US 5,110,388) in view of Izumi et al. (JP 2002343747 A) as applied above and further in view of Mignardi et al. (US 5,597,767) (as applied in the previous actions 9/2/2009 and 3/30/2010).

Regarding Claim 31, Komiyama et al. and Izumi et al. in combination fails to disclose a method as claimed in claim 25, wherein the step of laser machining includes

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a further step, after laser machining, of washing the structure to remove accumulated laser machining debris from the singulated die.

However, Mignardi et al. discloses a method of separating wafer wherein after laser scribing, the wafer is washed to remove particles during lasing (Column 4, line 8 – 11).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the invention of Komiyama et al. and Izumi et al. in combination with washing the die after lasing to remove debris as taught by Mignardi et al. as it would provide the motivation to remove unwanted debris formed during laser processes. The claim would have been obvious because the technique for improving a particular class of devices was part of the ordinary capabilities of a person of ordinary skill in the art, in view of the teaching of the technique for improvement in other situations (KSR International Co. v. Teleflex Inc., 82 USPQ2d 1385 (U.S. 2007)).

Regarding Claim 32, Komiyama et al., Izumi et al., and Mignardi et al. in combination a method as claimed in claim 31, wherein the step of providing a structure comprises providing a structure having a protective film to protect the structure from debris produced during laser machining (Mignardi et al., Column 3, line 32 – 35) and the step of washing the structure comprises removing the protective film and accumulated debris thereon (Mignardi et al., Column 4, line 8 – 11).

6. Claims 34 – 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Komiyama et al. (US 5,110,388) in view of Izumi et al. (JP 2002343747 A) as applied

above and further in view of Morris et al. (US 6,472,295 B1) (as applied in the previous actions 9/2/2009 and 3/30/2010).

Regarding Claim 34, Komiyama et al. and Izumi et al. in combination fail to disclose a method as claimed in claim 25, wherein the step of laser machining comprises providing an assist gas environment for laser machining.

However, Morris et al. discloses a method of laser cutting wherein a gas is provided during laser cutting (Column 10, line 1 – 5).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the invention of Komiyama et al. and Izumi et al. in combination with providing a gas during laser cutting as taught by Morris et al. as it would provide the motivation to actively remove debris and to cool the surface. The claim would have been obvious because the technique for improving a particular class of devices was part of the ordinary capabilities of a person of ordinary skill in the art, in view of the teaching of the technique for improvement in other situations (KSR International Co. v. Teleflex Inc., 82 USPQ2d 1385 (U.S. 2007)).

Regarding Claim 35, Komiyama et al., Izumi et al., and Morris et al. in combination disclose a method as claimed in claim 34, wherein the step of providing an assist gas environment comprises providing a gas environment in which photo-dissociation produces active radicals (Morris et al., Column 10, 1 – 5).

Regarding Claim 36, Komiyama et al., Izumi et al., and Morris et al. in combination disclose a method as claimed in claim 34, wherein the step of providing a

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gas environment reduces deposition of solid machining debris around a laser-machining site (Morris et al., Column 10, 1 – 5).

7. Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Komiyama et al. (US 5,110,388) in view of Izumi et al. (JP 2002343747 A) as applied above and further in view of Yamanaka (US 5,641,714) (as applied in the previous actions 9/2/2009 and 3/30/2010).

Regarding Claim 38, Komiyama et al., and Izumi et al. in combination fail to disclose a method as claimed in claim 25, wherein the step of providing a structure comprises providing the a wafer substrate separated facedown from substantially inflexible transparent backgrinding tape means by the adhesive layer and wherein the step of laser machining is performed subsequent to backgrinding the wafer substrate.

However, Yamanaka discloses a method of singulating a wafer into dies wherein a wafer is affixed to a tape and back-grinded to thin the wafer before dicing the wafer (Column 4, line 21 – 23; Fig. 2A).

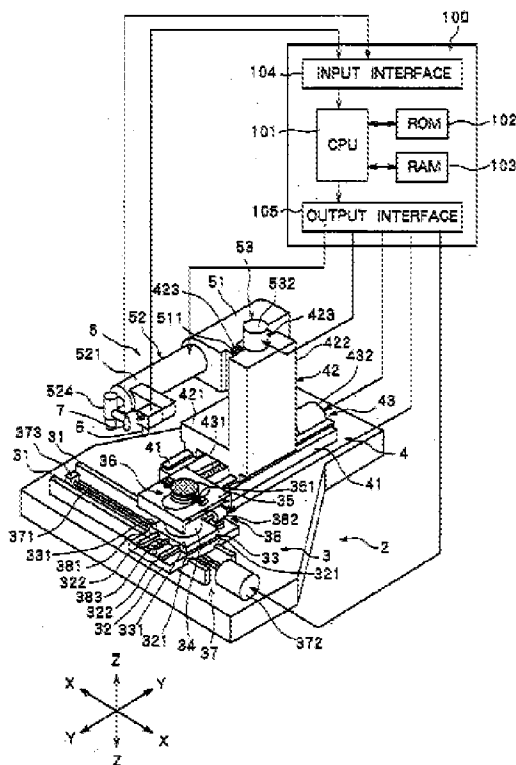
Therefore it would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the invention of Komiyama et al. and Izumi et al. in combination with performing a back-grinding step on the wafer prior to dicing as taught by Yamanaka as it would provide the motivation to form a substantially thin wafer prior to dicing to reduce the wafer to a desired thickness. The claim would have been obvious because the technique for improving a particular class of devices was part of the ordinary capabilities of a person of ordinary skill in the art, in view of the teaching of the

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technique for improvement in other situations (KSR International Co. v. Teleflex Inc., 82 USPQ2d 1385 (U.S. 2007)).

8. Claims 40, 41, and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shigematsu et al. (US 2005/0009307 A1).

Fig. 1



Regarding Claim 40, Shigematsu et al. discloses an apparatus comprising:

a laser source (52) arranged to provide a laser beam machining a structure including a wafer substrate, a carrier base, and an adhesive positioned between and adhered to the wafer substrate and the carrier base the laser beam operable to machine the wafer substrate and the adhesive layer to form a singulated die with an attached

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singulated adhesive layer, the attached singulated adhesive layer adapted to release from the carrier base when exposed to a first curing process and adapted to adhere to a die pad when placed on the die pad and exposed to a second curing process;

a laser scanner (53) cooperating with the laser source to impart movement of the laser beam relative to the wafer substrate;

a laser controller (100) cooperating with the laser source and the laser scanner to control machining parameters of the laser beam;

a memory (102,103) for storing laser machining profiles used by the laser controller for controlling the laser beam to cut through the wafer substrate and the adhesive layer to thereby form the singulated die and the attached singulated adhesive layer, the laser machining profiles including a first laser machining profile used to cut through the wafer substrate and a second laser machining profile used to cut through the adhesive layer.

The limitation of “arranged to provide a laser beam machining a structure including a wafer substrate, a carrier base, and an adhesive positioned between and adhered to the wafer substrate and the carrier base the laser beam operable to machine the wafer substrate and the adhesive layer to form a singulated die with an attached singulated adhesive layer, the attached singulated adhesive layer adapted to release from the carrier base when exposed to a first curing process and adapted to adhere to a die pad when placed on the die pad and exposed to a second curing process ... cooperating with the laser source to impart movement of the laser beam relative to the wafer substrate... for storing laser machining profiles used by the laser controller for

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controlling the laser beam to cut through the wafer substrate and the adhesive layer to thereby form the singulated die and the attached singulated adhesive layer, the laser machining profiles including a first laser machining profile used to cut through the wafer substrate and a second laser machining profile used to cut through the adhesive layer" are functional limitations. The laser source, laser scanner, laser controller, and memory are structural limitations. While features of an apparatus may be recited either structurally or functionally, claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Schreiber*, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997). A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987) (MPEP 2114). The recitation "a die bonding" has not been given patentable weight because the recitation occurs in the preamble. A preamble is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951).

Regarding Claim 41, Shigematsu et al. discloses the die bonding apparatus as claimed in claim 40, wherein the machining parameters of the laser beam include laser

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pulse power, laser wavelength, laser pulse repetition, laser pulse width, and laser scanning speed (Paragraph 0033, line 3 – 14, it is inherent that parameters of the laser beam include power and scanning speed since, there is a wavelength and movable parts for scanning), and wherein the first laser machining profile corresponds to a first set of values of the machining parameters and the second laser machining profile corresponds to a second set of values of the machining parameters, the values of the first and second sets being selected such that a speed of machining the structure is maximized while providing a predetermined quality of singulated dies without substantial delamination of the adhesive layer and the carrier base or substantial production of burrs. The limitations of "wherein the first laser machining profile corresponds to a first set of values of the machining parameters and the second laser machining profile corresponds to a second set of values of the machining parameters, the values of the first and second sets being selected such that a speed of machining the structure is maximized while providing a predetermined quality of singulated dies without substantial delamination of the adhesive layer and the carrier base or substantial production of burrs" are functional limitations. While features of an apparatus may be recited either structurally or functionally, claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function. >*In re Schreiber*, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997). A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2

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USPQ2d 1647 (Bd. Pat. App. & Inter. 1987) (MPEP 2114). The recitation “a die bonding” has not been given patentable weight because the recitation occurs in the preamble. A preamble is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951).

Regarding Claim 42, Shigematsu et al. discloses the die bonding apparatus as claimed in claim 41, wherein the machining parameters include a number of scans by the pulsed laser beam (Paragraph 0033, line 3 – 14).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SHAKA SCARLETT whose telephone number is (571)270-3089. The examiner can normally be reached on Monday-Friday 7:30 AM - 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on (571) 272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

August 31, 2010
/Shaka Scarlett/
Examiner, Art Unit 2823

/Julio J. Maldonado/
Primary Examiner, Art Unit 2823